Bamboo Processing

Level-II

Based on November, 2021, version Occupational Standard (OS)

Module Title: Set up, operating and maintaining Bamboo processing machine

LG Code: IND ND BPP2 M01LO (1-4) LG (29-32)
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November, 2021

Contents

LG #30	LO #1- Prepare for work

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Enterprise requirements
- Workplace health and safety requirements
- Identifying and checking tools and equipments.
- Carrying out routine pre-operational checks on machinery and equipment and adjustment
- Reading and interpreting cutting list and job specifications.
- Determining procedures for minimizing waste materials and maximize energy efficiency.
- Supplies required to carrying out routine maintenance for advance bamboo processing machine.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Observe workplace health and safety requirements, including personal protecting equipment's throughout the work.
- Identity and check tool and equipment
- Adjust and check routine pre-operational of machinery and equipment made according to the manufacturer's specifications.
- Read and interpreted Cutting list and job specifications
- Determine procedures for minimizing waste material and maximize energy efficiency.
- Identify, selected, and provided supplies required to carry out routine maintenance for advance bamboo processing machines on-site according to maintenance procedures

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Workplace health and safety requirements

1.1 Introduction

Workshop is the place where various kinds of machineries are being used and it contains many potential safety hazards. The purpose of safety measure is to prevent fatal accidents and provide emergency help. Therefore, it is very important that the rules and guidelines are followed. The laws that govern occupational health and safety in a bamboo processing workplace are very important to each and every learner. The learner should be able to identify typical workplace hazards and follow procedures that will control the risks associated with those hazards to prevent injury, illness and death. The knowledge of workshop safety measures will enable the learners to respond correctly and safely in an emergency situation that may arise in a bamboo processing workplace and to take appropriate safety measures.

1.2 General workshop safety rules

- Wear eye protection (e.g. safety glasses) when operating machines.
- Do not operate a machine if you are the only person in the shop. At least one other member must be present.
- Do not wear loose clothing, jewellery or other dangling objects that can be caught in a machine.
- Tie back long hair so that it cannot be caught in a machine.
- Wear hearing protection when operating noisy machines.
- Switch off a machine after use and wait for it to stop before leaving it. Do not leave a machine that is switched on to conduct another task regardless of how short that task may be.
- Clean up the machine after use.
- Always unplug the machine before conducting any maintenance operation or changing blades.
- Do not remove safety guards unless this is essential to perform an operation. (Removing the blade guard on the saw stop to perform non through cuts and high angle miter cuts are the only operations where the safety guard can be removed)
- Never rush a job because others are waiting to use the machine.
- Do not operate a machine if you are tired or under the influence of drugs, particularly prescription medications that affect your mental performance or have partaken of alcohol before arriving at the shed.

1.3 Safety clothing and equipment

The following are some of the important safety clothing and equipment one should strictly wear while working with bamboo in the workshop. They are; - A) safety glass B) mask C) apron d) Hand gloves e) first aid kit.

A) Safety glass

Safety glass is a glass which has safety features to protect eyes while working in the workshop. There are many types of glasses available in the market like toughened glass, laminated glass and wire mesh glass for workshop safety.

B) Mask

When working in the bamboo workshop, you can breathe in lot of dusts that can cause serious lung diseases. In such conditions, it is advised to use dust mask to protect oneself. A dust mask is a pad held over the nose and mouth by elastic or rubber straps to protect against dusts encountered during workshop activities.

C) Apron

An apron is an outer protective garment that covers primarily the front of the body. It is worn for various safety reasons in the workshop to protect oneself from many hazards. Aprons are available in different materials and the learner should wear a thick cloth apron for bamboo activities in the workshop.

D) Hand gloves

Hand gloves are worn to protect hands from cuts and abrasions, chemicals, heat and most of the work environments. Hand gloves are made from leather, cotton, synthetics, nitrite, latex etc. to offer maximum protection and comfort.

E) First aid kit

A first aid kit consists of equipment for treating minor injuries by an individual. Typical contents include adhesive bandages, crepe bandage, finger bandage, scissors, hypo allergic tape, disposable gloves, regular pain medication, gauze and disinfectant. It is important to keep all kits in a clean condition and waterproof container to keep them safe and aseptic. The contents of the kit should be checked

regularly and stocked if any items are damaged or expired out of date. Other than the above mentioned safety measures one should keep in mind the following strictly.

- No casual attitude in the workshop premise.
- Wear suitable personal clothing to the workshop conditions.
- Appropriate footwear should be worn.
- Never run in the workshop.
- Label safety equipment and maintain in good condition.
- Keep all fire-escape routes completely clear at all times.
- Ensure that all safety equipment remains accessible to the workshop personnel at all times.

Self-check 1	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2) point each

1. Identify typical workplace hazards and follow procedures will control the risks associated with those hazards to prevent

   A. Injury B. illness C. death D, all

2. ----- is an outer protective garment that covers primarily the front of the body.

   A. Apron B. Hand gloves C. First aid kit D. Hand gloves

Test II: write short answer for the following questions

1. List at list four (4) general workshop safety rules (4 point)
2. Write the purpose of safety measure (2 point)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points ***Unsatisfactory - below 10 points***

Information Sheet 2 - Enterprise requirements

Enterprise needs to provide quality products to their customers. Thus, they should perform Standard Operating Procedures (SOPs). SOPs are step-by-step instructions that define how to perform repetitive business processes to achieve desired outcomes. They often accompany preventive maintenance (PM) work orders, inspection audits, and quality-control checklists. The best SOPs supplement procedural checklists with illustrations, photographs, flow charts, and linked resources to further clarify work instructions.

In the manufacturing industry, SOPs are crucial to achieving production-line efficiency, uniform performance (of both machines and workers), regulatory compliance, and high-quality final products. Here are six of the leading benefits of implementing SOPs on-site:

- Standardization
- Communication
- Efficiency
- Regulatory Compliance and Quality Assurance
- Accountability and Tracking
- Downtime

1. Standardization

The very purpose of a standard operating procedure is to establish a standard and consistent way of completing a task. Assigning approved SOPs ensures workers always perform tasks in the same manner across manufacturing facilities and production lines.

Manufacturing SOPs streamline processes, improve consistency, and allow management to make informed business decisions based on how well a standard works.

2. Communication

Once standardized, managers can easily share data metrics with team members, thus improving communication from top to bottom. This will also reduce the risk of non-compliance, improve supply chain efficiencies, and streamline project management.

Manufacturing SOPs communicate across all facility and team levels. When digitized, standardized manufacturing SOPs provides real-time important information to workers and managers about work being done, how it is being done, and if something is getting in the way. SOPs can even standardize how a team communicates. Streamlining internal communications creates efficiencies across the company.

3. Efficiency

Managers are always looking to improve production efficiency with their teams. SOPs make workforces more efficient, predictable, and measurable. From how a new piece of equipment runs to how a manager audits performance, repeatable processes can always be made more efficient with procedure templates. Perhaps a few steps are redundant and don't present any additional value. Or, you may discover a frequent error or mistake that can be prevented by adding a step to account for the issues.

4. Regulatory Compliance and Quality Assurance

Manufacturing facility and product inspectors frequently ask to review standard operating procedure when auditing operations. And, in the case of legal action, SOPs can serve as crucial defense documentation of procedures followed within industry guidelines. OSHA's General Duty Clause enforces worker health and safety. OSHA inspectors look for anything that can cause danger or bodily harm and impact an employee's life on or off the job.

Step-by-step SOPs are crucial for reinforcing safety and compliance standards. Online workflows improve a company's credibility and legal defenses. In fact, during auditing procedures, inspectors frequently rely on completed SOPs as checklists. Running quality systems is also an important part of a manufacturing company. The International Organization for Standardization (ISO) developed ISO 9000 to define a "quality management system." The ISO advises companies to:

A) Consistently provide products and services that meet customer and legal and regulatory requirements, and
B) Enhance customer satisfaction through the effective application of the system, including processes to improve the system.

Increasing laws and regulations call for increased regulatory compliance and quality management through effective standard operating procedures. The American Society for Quality (ASQ) defines quality as both a) the characteristics of a product or service that bear on its ability to satisfy stated or implied need, and b) a product or service free of deficiencies.

As part of any quality assurance plan, SOPs implementation is key. In fact, if and when lawyers get involved, having SOPs in place—and easily accessible through a digital platform with audit trails–-makes a huge difference. Quality standard operating procedures show lawyers and the courts that a company adheres to standards and regulations.

5. Accountability and Tracking

SOPs should clearly define who is responsible for completing the work order, preventive maintenance check, or inspection. SOPs improve accountability across the manufacturing floor. If a task isn't completed accurately, and a standard operating procedure wasn't followed, management can take appropriate action to prevent inaction or missteps from recurring.

Manufacturing compliance requires troubleshooting problems, tracking decisions, and explaining why changes were made. Tracking is easier when SOPs are digitized, especially when suppliers and new outsourcing are involved. Owners and manufacturing managers can also use completed digital standard operating procedures to gather data and carry out critical audits and inspections on the factory floor. Collecting and analyzing this data in real-time increases compliance in the manufacturing process.

6. Downtime

Writing standard operating procedures to eliminate the eight primary types of waste—that form the word, DOWNTIME—maximizes efficiency:

- **Defects: -** avoid manufacturing errors and poor-quality output.
- **Overproduction: -** don't manufacture any more than the required amount.
- **Waiting: –** prevent all unplanned manufacturing downtime or wait time.
- **Non-utilized talent: –** reduce overstaffing or unused workforce.
- **Transportation: –** cut unnecessary distance travelled from one location to another.
- **Inventory: –** get rid of inefficient storage management.
- **Motion: –** avoid excess movement by workers and manufacturing equipment that don't add value.
- **Excess manufacturing processes: -** remove any processes that don't add value.

Once implemented, manufacturing standard operating procedures can help owners and production managers monitor the success and failures of a manufacturing line, piece of essential equipment, or work team.

Self-check 2	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test II: Choose the best answer (2) point

1. From the following which one is not the importance of writing standard operating procedures?

   A. Inventory B. Motion C. Transportation D. utilized talent E, all

Test II: write short answer for the following questions

1. List at list four benefits of Standard Operating Procedures (SOPs)? (4 point)
2. Define Standard Operating Procedures (SOPs) shortly? (2 point)
3. The American Society for Quality (ASQ) defines quality (2 point)

   A. _____

   B. _____

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points ***Unsatisfactory - below 10 points***

Information Sheet 3 - Identifying and checking tools and equipments

In order to set up and adjust bamboo machineries, various types of set up tools used. There are 6 (six) essential machinery setup tools. Properly adjusted machines make better cuts and you can dial in peak performance on your stationary machines with this practical set of tune-up tools. The 6 (six) essential machinery setup tools

Combination square

Adjustable triangle

Engineers' square/try square

Long straightedge

Dial indicator

Alignment plate

1. Combination square

In many shops, this multifunction tool finds use only when scribing a line across a work piece. What a shame! You can use the head alone to set 45 degree and 90 degree angles on a table saw blade, miter gauge, or jointer fence. Lock the head in position on the rule to check the distance from a router bit to the router-table fence ***(above)*** or the height of a table saw blade. Hold the edge of the rule against the router-table fence to set a router-bit bearing flush.

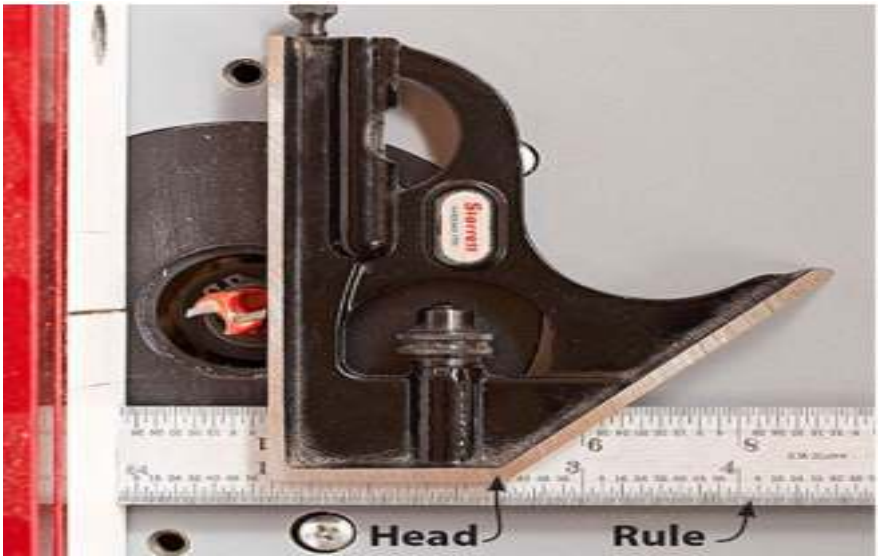


Figure1. Combination square

2. Adjustable triangle

Not every angle 90 degrees or 45 degrees. For anything in between, add an adjustable triangle to your tool kit. You'll find one at an art-supply store.

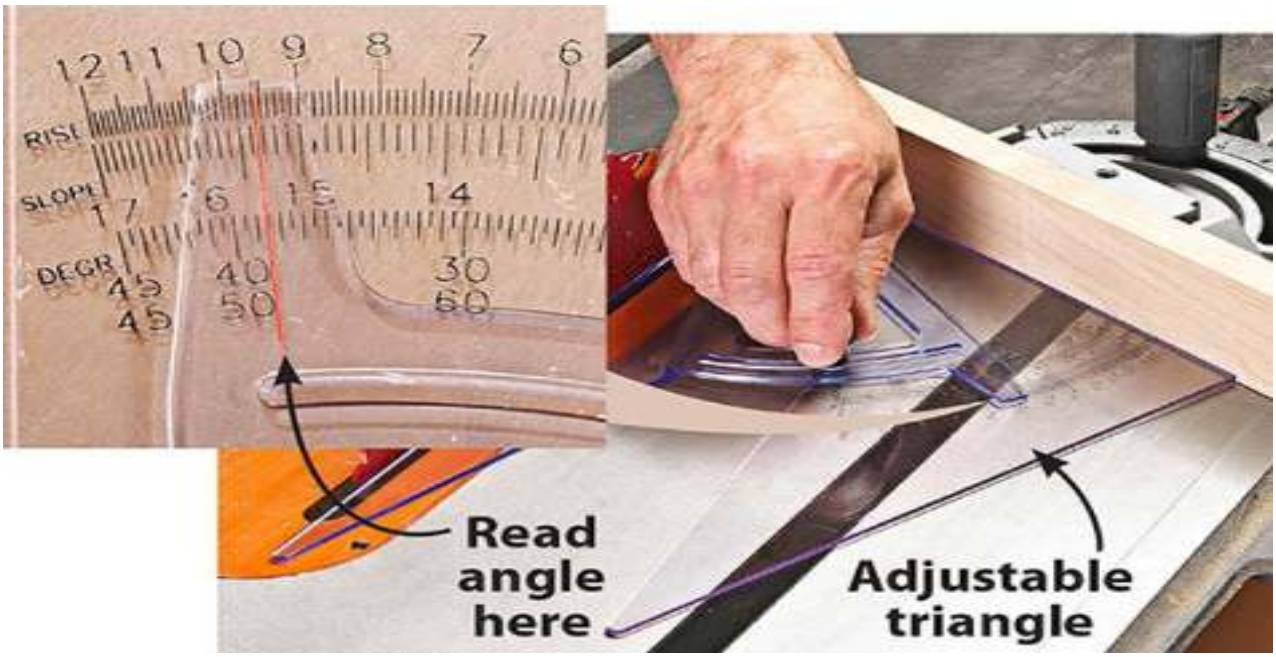


Figure.2 Adjustable triangle

Engineers' square/try square

This miniature marvel squeezes into spaces where a bigger square can't. It fits in an apron pocket, so it's always at your fingertips for checking square on machine setups or work piece edges after completing a cut.

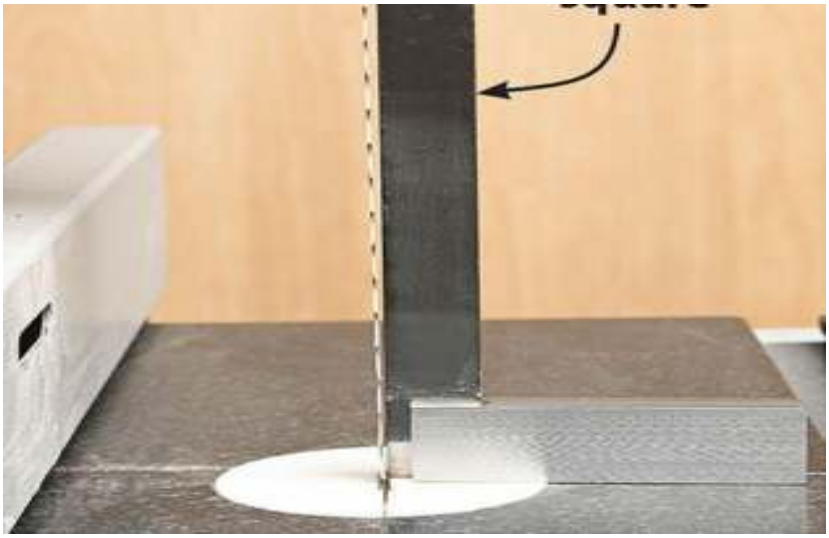


Figure3. Engineers' square/try square

Long straightedge

Tables and extension wings sag, cast iron warps, and moving machines around bumps them out of alignment. A straightedge helps you spot problems in surfaces that are supposed to be flat.

For these jobs, use a long metal rule that easily shows gaps and irregularities under its narrow edge. Simply clamp a spring clamp on one end, and it stands on edge, freeing your hands to fine-tune the machine. We found 48" and 60" steel rules at big-box lumberyards.

Figure4. Long straightedge

Dial indicator

When checking a setup requires minuscule measurements, reach for a dial indicator. It shows increments as fine as 1/1000". You can spend a lot, but an inexpensive one will do the job. A jig keeps the indicator stationary while taking measurements. Purchase one like the Super Bar (above left), or make your own for setting jointer knives (below left). Find a free plan for the jointer jig at woodmagazine.com/jointer jig.

Figure5. Dial indicator

Alignment plate

Mount this dead-flat, machined plate in place of a saw blade in your table saw, radial-arm saw, or miter saw. It provides a longer, truer surface than a saw blade for taking measurements and checking setups.

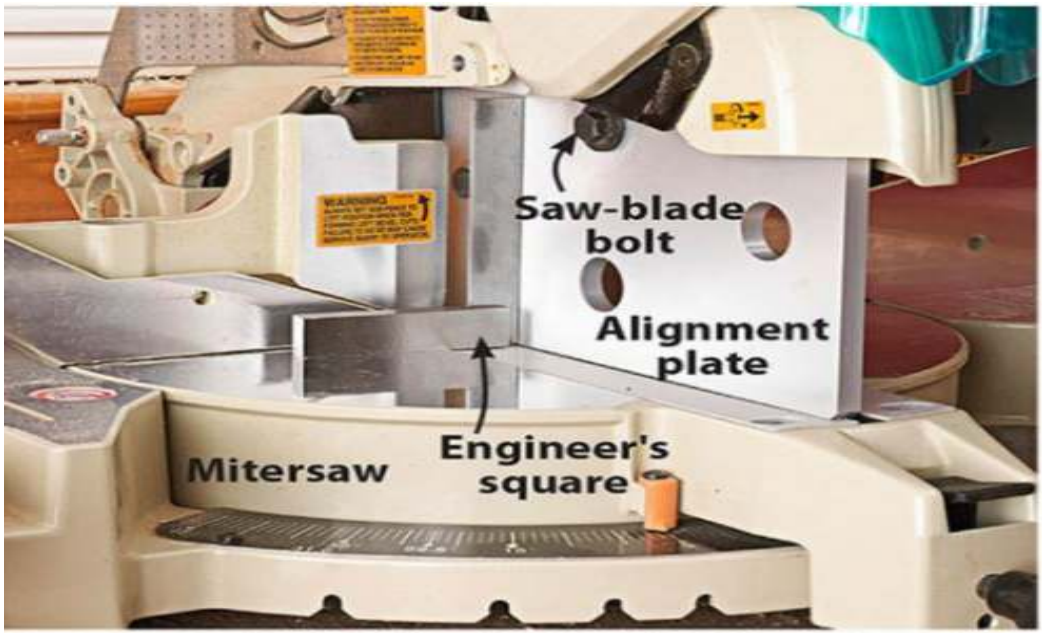


Figure6. Alignement plate

Self-check 3	Written test

Name…… ID…… Date……..

Directions: Answer all the questions below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: write short answer for the following questions

1. **What is the important of using machine set up tools? (2 points)**

Machinery setup tools (6 points)

3. **----------provides a longer, truer surface than a saw blade for taking measurements and checking setups. (1 points)**

4. **----------shows gaps and irregularities under its narrow edge (1 points)**

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points ***Unsatisfactory - below 10 points***

Information Sheet 4- Carrying out routine pre-operational checks on machinery and equipment and adjustment

The reason for conducting pre-operational and regular checks is to reduce accidents occurred during operations and the potential for time out of the paddock due to maintenance issues to ensure the machine system is working correctly and efficiently.

There are many things the operator should check on a regular basis before starting operation.

- Make sure the guard is in position, is in good working condition, and guards the machine adequately before operating any equipment or machine. Check and adjust all other safety devices.
- Make sure the equipment is properly grounded before use.
- Check that keys and adjusting wrenches are removed from the machine before turning on the power.
- Inspect stock for nails, staples, loose knots or other defects before cutting, planning, routing or carrying out similar activities.
- Make sure that all machines have start and stop buttons within easy and convenient reach of an operator. Start buttons should be protected so that accidental contact will not start the machine. A collar around the button 3 to 6 mm (1/8 to 1/4 inch) above the button is recommended.
- Ensure that all cutting tools and blades are clean, sharp, and in good working order so that they will cut freely, not forced.
- Turn the power off and unplug the power cord (or lock out the power source) before inspecting, changing, cleaning, adjusting or repairing a blade or a machine.
- Clamp down and secure all work pieces when drilling, sanding, cutting or milling.
- Use good lighting so that the work piece, cutting blades, and machine controls can be seen clearly. Position or shade lighting sources so they do not shine in the operator's eyes or cause any glare and reflections.

In general Woodworking /bamboo tools can be dangerous if not used properly. Thus,

- Only use woodworking machines that you have been trained to use properly and safely.
- Read the owner's manual carefully.
- Make sure you understand instructions before attempting to use any tool or machine. Ask questions if you have any doubts about doing the work safely.

Self-check 5	Written test

Name…… ID…… Date…….....

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: write short answer for the following questions

The reason for conducting pre-operational and regular checks (2 points)

Write at list at least 4 activities that operator should check on a regular basis before starting operation. (2 points)

You can ask you teacher for the copy of the correct answers.

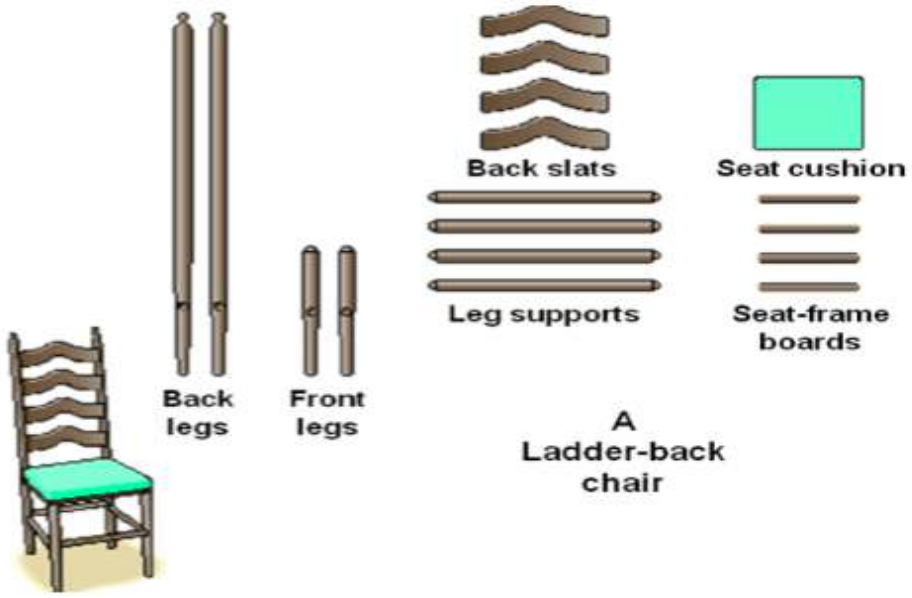
Note: Satisfactory rating - 8 points ***Unsatisfactory - below 8 points***

Information Sheet 5- Reading and interpreting cutting list and job specifications

5.1 Bill of material

Bill of material (MBOM) is a type of bill of material reflecting the product as planned by manufacturing engineering, also referred to as the "as manufactured" or "as built" bill of material. This type of Manufacturing Bill of Materials may and most times does differ from an engineered Bill of Materials. The As built structure is meant to reflect how an end item is manufactured on the shop floor. It is a list of the parts, materials, documents and tools required in the manufacture of a product.

BOM includes material that is contained in drawing notes and typically also includes an indicator of whether manufacturing intends on buying or making the indicated material. Drawing is used to describe the complete set of drawing produced by the designer, manufacturer, or fabricator that show the shape and detailed dimension and contain parts list, or bill of materials (BOM) and information needed for assembly of a product to be made based on its design. Figure 2 shows a typical part list of a chair. The BOM of the chair is shown in Figure below



5. 2. What to include in an effective bill of materials

Because one of the main functions of the BOM is to ensure that the product is built right, it is best to include specific pieces of product data in the BOM record. Whether you are creating your first bill of materials or are looking for ways to improve how you create a bill of materials, here is a high-level list of information to include in your BOM record:

- **BOM Level**—Assign each part or assembly a number to detail where it fits in the hierarchy of the BOM. This allows anyone with an understanding of the BOM structure to quickly decipher the BOM.

- **Part Number**—Assign a part number to each part or assembly in order to reference and identify parts quickly. It is common for manufacturers to choose either an intelligent or non-intelligent part numbering scheme. Whichever scheme you use, make sure you avoid creating multiple part numbers for the same part.

- **Part Name**—Record the unique name of each part or assembly. This will help you identify parts more easily.

- **Phase**—Record what stage each part is at in its lifecycle. For parts in production, it is common to use a term like 'In Production' to indicate the stage of the part. New parts that have not yet been approved can be classified as 'Unreleased' or 'In Design'. This is helpful during new product introduction (NPI) because it allows you to easily track progress and create realistic project timelines.

- **Description**—Provide a detailed description of each part that will help you and others distinguish between similar parts and identify specific parts more easily.

- **Quantity**—Record the number of parts to be used in each assembly or subassembly to help guide purchasing and manufacturing decisions and activities.

- **Unit of Measure**—Classify the measurement in which a part will be used or purchased. It is common to use 'each', but standard measures like inches, feet, ounces, and drops are also suitable classifications. Be consistent across all similar part types because the information will help make sure the right quantities are procured and delivered to the production line.

- **Procurement Type**—Document how each part is purchased or made (i.e. off-the-shelf or made-to-specification) to create efficiencies in manufacturing, planning, and procurement activities.

Table1. Sample of bill of materials (Procurement Type) for chair production

Item No	Item Description	Quantity	Unit cost	Total cost
1.	Wood 20*300*4000 mm	1 pieces	350	350
2.	Ply wood	1/8 pieces	200	28
3.	White glue	0.1 liter	70	7
4.	Sand paper 150	½	12	6
5.	Polyurethane varnish	0.25	100	25
6.	Lacquer thinner	1 liter	50	50

Self-check 5	Written test

Name…… ID…… Date……..

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: write short answer for the following questions

1. Write the importance of bill of materials (3points)
2. List down components in which an effective bill of materials includes (5points)
3. Define bill of materials (2 points)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points ***Unsatisfactory - below 10 points***

Score = _____

Rating: _____

Information Sheet 6 - Determining procedures for minimizing waste materials and maximize energy efficiency.

6.1 Introduction

Traditionally, waste is viewed as an unnecessary element arising from the activities of any industry. In reality, waste is a misplaced resource, existing at a wrong place at a wrong time.

Waste is also the inefficient use of utilities such as electricity, water, and fuel, which are often considered unavoidable overheads. The costs of these wastes are generally underestimated by managers. It is important to realize that the cost of waste is not only the cost of waste disposal, but also other costs such as:

- Disposal cost
- Inefficient energy use cost
- Purchase cost of wasted raw material
- Production cost for the waste material
- Management time spent on waste material
- Lost revenue for what could have been a product instead of waste
- Potential liabilities due to waste.

6.2 What is waste minimization?

Waste minimization can be defined as "systematically reducing waste at source". It means:

- Prevention and/or reduction of waste generated
- Efficient use of raw materials and packaging
- Efficient use of fuel, electricity and water
- Improving the quality of waste generated to facilitate recycling and/or reduce hazard
- Encouraging re-use, recycling and recovery.

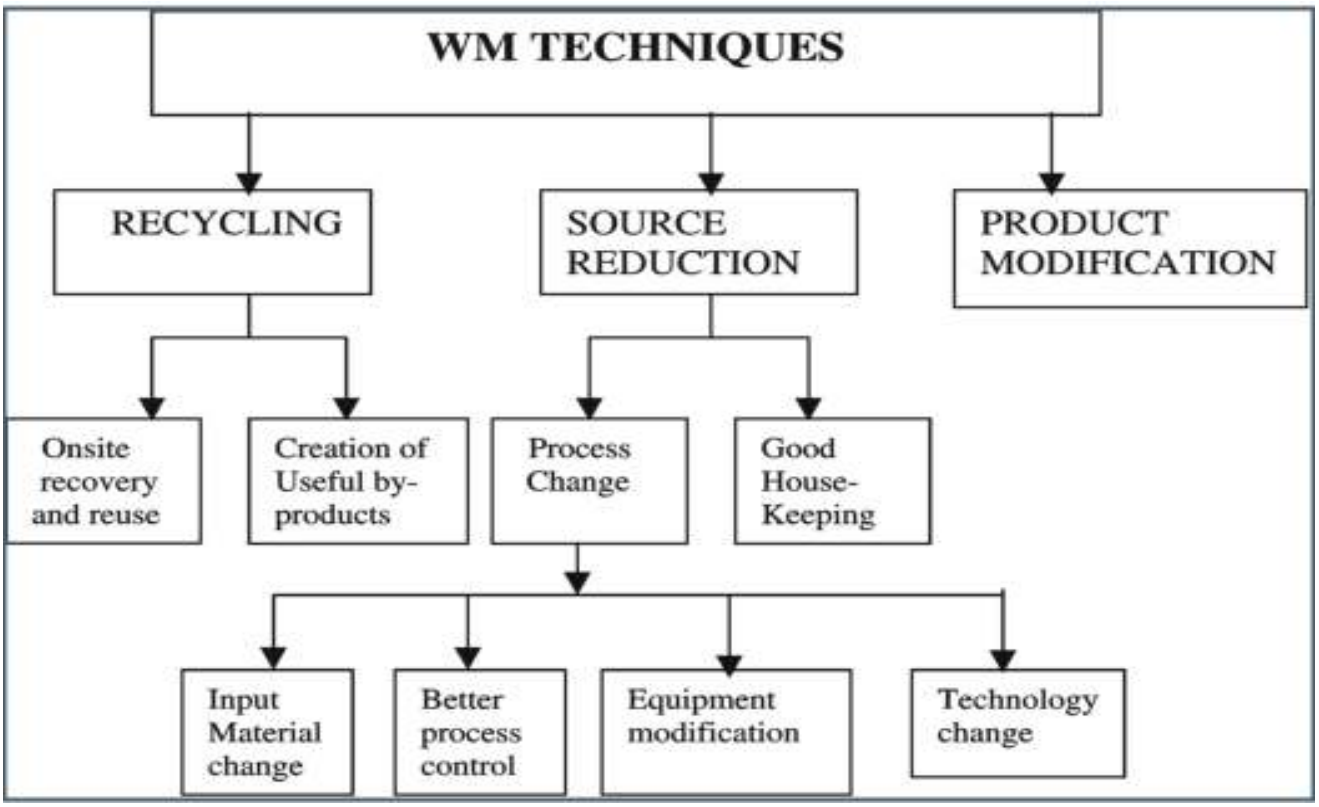
Waste minimization; - is also known by other terms such as waste reduction, pollution prevention, source reduction and cleaner technology. It makes use of managerial and/or technical interventions to make industrial operations inherently pollution free.

It should be also clearly understood that waste minimization, however attractive, is not a panacea for all environmental problems and may have to be supported by conventional treatment/disposal solutions.

Waste minimization is best practiced by reducing the generation of waste at the source itself. After exhausting the source reduction opportunities, attempts should be made to recycle the waste within the unit. Finally, modification or reformulation of products so as to manufacture it with least waste generation should be considered.

6.3 Classification of Waste Minimization (WM) Techniques

The waste minimization is based on different techniques. These techniques are classified as hereunder.



6.3 Source Reduction

Under this category, four techniques of WM are briefly discussed below:

A) **Good Housekeeping:-**Systems to prevent leakages & spillages through preventive maintenance schedules and routine equipment inspections. Also, well-written working instructions, supervision, awareness and regular training of workforce would facilitate good housekeeping.

B) Process Change: - Under this head, four techniques are covered:

I. ***Input Material Change*: -** Substitution of input materials by eco-friendly (non-toxic or less toxic than existing and renewable) material preferably has longer service time.

II. ***Better Process Control*: -** Modifications of the working procedures, machine operating instructions and process record keeping in order running the processes at higher efficiency and with lower waste generation and emissions.

III. ***Equipment Modification*:** - Modification of existing production equipment and utilities, for instance, by the addition of measuring and controlling devices, in order to run the processes at higher efficiency and lower waste and emission generation rates.

IV. ***Technology change: -*** Replacement of the technology, processing sequence and/or synthesis route, in order to minimize waste and emission generation during production.

C) Recycling

I. ***On-site Recovery and Reuse***: - Reuse of wasted materials in the same process or for another useful application within the industry.

II. ***Production of Useful by-product:-*** Modification of the waste generation processes order to transform the wasted material into a material that can be reused or recycled for another application within or outside the company.

D) Product Modification

Characteristics of the product can be modified to minimize the environmental impacts of its production or those of the product itself during or after its use (disposal).

Self-check 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 points)

1. Waste minimization also known as

A. waste reduction B. pollution prevention C. source reduction

D. Cleaner technology E, all

Test II: write short answer for the following questions

1. Define waste (2 points)
2. List source reduction under production process (4 points)
3. List four techniques of WM (waste management's) (4 points)

A._____

B. _____

C. _____

D. _____

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 12 points ***Unsatisfactory - below 12 points***

Information Sheet 7- Supplies required to carrying out routine maintenance for advance bamboo processing machine.

7.1 Routine maintenance

Routine maintenance (RM) is defined as maintenance activities carried out on a regular basis. Tasks can be performed daily, weekly, monthly, or annually. Routine maintenance typically includes regular inspections and machine servicing. The primary goal is to identify problems on an ongoing basis before they result in equipment failure.

Routine maintenance also refers to any maintenance task that is done on a planned and ongoing basis to identify and prevent problems before they result in equipment failure. Some common routine maintenance includes regular inspections or service work. Some of the Supplies to carry out routine maintenance are:-

- **Cleaner and degreaser**
  - ✓ Quickly removes brake fluid, grease, oil and brake dust while leaving no residue
  - ✓ The fast drying solvent helps dislodge surface dirt and oil to eliminate brake squeal
  - ✓ Safe for use on electric motors, switches and distributor contacts during maintenance (do not apply to electrical components whilst they are in service).
- **Gloves**
- **Safety equipment**
- **Industrial Equipment (Grease guns, valves, compressors, pumps)**
- **Consumables (cleaning, laboratory and office supplies)**
- **Plant upkeep supplies (lubrications, Gaskets, repair tools)**
- **Water**

Don't confuse greasing with lubricating a machine with oil. Grease performs the same function as oil but it's thicker and lasts longer, so it's the better choice for hard-to-reach areas inside machinery that would be more expensive to lubricate regularly. A coating of thick grease can also serve as a layer of protection for the equipment, catching dust and other debris before it reaches crucial components.

Self-check 7	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: Say true or false

1. Grease and oil has similar function.
2. Routine maintenance is carried out when equipment failure is occurred

Test II: write short answer for the following questions

1. Define routine maintenance (2 points)
3. List at least 3 supplies to carry out routine maintenance (3 points)

LG #31	LO #2- Set-up machines

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Checking safety equipment
- Making machine set-up and adjustment.
- Conducting trial runes
- Making necessary adjustment

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Check safety equipment, including emergency stops, gauges, guards, and controls are checked.
- Set up and adjustment machines according to job requirements concerning machine and tool manufacturer instructions.
- Conduct trial runs to check machine operation, accuracy, and quality of finished work.
- Made proper machine set-up and necessary adjustment

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go

back to “Operation sheets”.

Information Sheet 1- Checking safety equipment

A number of different machine hazards are possible, ranging from those inherent to the machine itself to hazards created by the operator or environment in which the machine is located. Take into consideration different tasks, operator competencies, operating modes, and failure scenarios. Thus, before operating machines the operator should;-

- Wear Personal Protective Equipment (PPE). Examples include: safety glasses, face shields, ear plugs, protective footwear, helmets, respirators, etc.
- Guards or safeguarding devices. Examples include: barriers, interlocks, presence sensing devices, two-handed controls, etc.
- Awareness devices. Examples include: lights, beacons, strobes, computer warnings, signs, labels, beepers, horns, sirens, fences/barrier tape, etc.
- Elimination or substitution through inherently safer design. Examples include: automated material handling, substitution of less hazardous chemicals/fluids, reduced mechanical force/energy, elimination of pinch points by increasing clearances, etc.

In general to operate machine

- Check machine safety device (i.e. guards, fence, emergency stops, gauges etc)
- Wear Personal protective equipments

Protective clothes

Sturdy, tight-fitting clothing (tear-resistant, no wide sleeves)

Protective footwear

That protects the feet from heavy falling objects and prevents sliding on slippery floors

Hearing protection

To protect against loss of hearing

Self-check 1	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: write short answer for the following questions

1. Write the importance of checking safety equipment before operating a machine (2 points
2. List safety equipment that needs to check before operating the machines (4 points)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 6 points ***Unsatisfactory - below 6 points***

2.1 Circular saws

The primary operational function of a circular saw is to cut material to a given size along its length. This involves:

- cutting to width, known as 'flat cutting'
- cutting to thickness, known as 'deep cutting'
- angle cutting (or angular cutting) in certain circumstances

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Carrying out machine start-up procedure.
- Feeding material into the machine.
- Monitoring machine operation.
- Identifying & reporting machine problems

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Carry out Lubrication and other basic servicing of machinery and equipment according to the operator's manual/manufacturers.
- Made routine adjustments and repairs to machinery and equipment according to operators' manual /manufacturer's specifications and supervisors' instructions.
- Clean, return and store tools to operating order according to manufacturers' specifications and enterprise requirements.
- Collect, treat, and dispose or recycle waste from maintenance activities according to enterprise requirements by following environmental procedures.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the "Self-checks" which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to "Operation sheets
7. Perform "the Learning activity performance test" which is placed following

“Operation sheets” ,

8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Carrying out lubrication of machinery and equipment

1.1 purpose of lubrication

The main purpose of lubrication is to reduce friction and wear inside the bearings that may cause premature failure. The effects of lubrication briefly explained as follows.

I. Reduction of friction and wear

Direct metallic contact between the bearing rings, rolling elements and cage, which are the basic components of a bearing, is prevented by oil film which reduces the friction and wear in the contact areas.

II. Extension of fatigue life

The rolling fatigue life bearing depends greatly upon the viscosity of and film thickness between the rolling contact surfaces. A heavy film thickness prolongs the fatigue life, but it is shortened if the viscosity of the oil is too low so the film thickness is insufficient.

III. Dissipation of frictional heat and cooling

Circulation lubrication may be used to carry bout away frictional heat or heat transfer from the outside to prevent the bearing from overheating and the oil from deterioration.

VI. Other

Adequate lubrication also helps to prevent foreign material from entering the bearings and guard against corrosion or rust.

1.2 Lubricating methods

The various lubricating methods are first divided in to either grease or oil lubrication. Satisfactory bearing performance can be achieved by adopting the lubricating methods which is most suitable for the particular lubricating method is most suitable for the particular application and operating condition. In general, oil is offers superior lubrication; however grease lubrication allows a simpler structure around the bearing. A comparison of grease and oil lubrication is given in table below.

Table2. Comparison of grease and oil lubrication

Item	Grease lubrication	Oil lubrication
Housing structure and sealing methods	Simple	May be complex, careful maintenance required
Speed	Limiting speed is 65%to 80% of that with oil lubrication.	Higher limiting speed.
Cooling effect	Poor	Heat transfer is possible using forced oil circulation
Fluidity	Poor	Good
Full lubricant replacement	Something difficult	Easy
Removal of foreign	Removal of particles from grease is impossible	Easy
External contamination due to	Surroundings seldom	Often leaks without proper

leakage	contaminated by leakage	countermeasures not suitable if contamination must be avoided

A. Grease lubrication

- **Grease quantity:**-depends on housing design and free space, grease characteristics, and ambient temperature. For example, the bearings for the main shafts of machine tools, where the accuracy may be impaired by small temperature rise, require only a small amount of grease.
- **Replacement of grease:** - for several operating condition grease should be frequently replenished.
- **Replenishing interval:** - even if high quality of grease is used, there is deterioration of its properties with time, therefore periodic Replenishment is required.
- **Grease life of sealed ball bearing:** - when grease is packed in to single –row deep groove ball bearings, the grease life may be estimated by the general purpose of grease.

B. Oil lubrication

- **Oil bath lubrication:** - Oil bath lubrication is a widely lubrication used with low or medium speed.
- **Drip-feed lubrication:** - Drip-feed lubrication is widely used for small ball bearing operated relatively high speed.
- **Splash lubrication:**-with this lubrication method, oil is splashed on to the bearings by gears or a simple rotating disc installed near bearings by gearings without submerging the bearing in oil.
- **Circulation lubrication:** - Circulation lubrication is commonly used for high speed operation requiring bearing cooling and for bearings used high temperature.
- **Jet lubrication :** - is often used for ultra high speed bearings, such as bearings in jet engines
- **Oil mist lubrication:** - Oil mist lubrication also called oil fog lubrication, utilizes an oil mist sprayed into bearing.
- **Oil /Air lubricating method:** - using air/air lubricating methods, a very small amount of oil is discharged intermittently by a constant quantity piston in to pipe

carrying a constant flow of compressed air.

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Self-check 1	Written test

Name…… ID……Date……

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: - say true or false (1 point each)

1. Grease lubrication has good Fluidity than oil lubrication.
2. Oil bath lubrication is a widely lubrication used with low or medium speed.

Test II: write short answer for the following questions

1. Write of lubricating method (2 points)
2. List the effects of lubrication (4 points)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 8 points ***Unsatisfactory - below 8 points***

Information Sheet 2- Routine adjustments and repairs

2.1 Introduction

Routine maintenance tasks are small and simple in nature and only require basic maintenance skills to perform well. They may be completed daily, weekly, monthly, quarterly, or annually. Companies that invest in routine maintenance can extend the life of their assets, reduce emergency maintenance, and keep their production lines or facilities up and running more consistently.

2.2 Typical examples of routine maintenance

- Checking/ cleaning machine parts
- Keep the saw clean.
- Keep the blades sharp.
- Clean and lubricate parts.
- Adjust and inspect the parts.
- Changing the motor brushes.
- Replacing the drive belt.
- Checking/ changing the friction wheel

2.3 Dismantling and assembling

The main stages of dismantling are;

- Dismantling proper, taking the machine parts and in a strict sequence.
- Dismantling should commence with the removal of guards, protective devices, followed by disconnection of transmissions and withdrawal of belts, after which the machine is broken-down into its units in a definite order.
- Cleaning can be done by kerosene and petrol.
- Cleaning, washing and wiping, drying the dismantled parts.

2.4 Testing and tightening

All preparatory measures are carried out during the first stage; they include check of the quality of work performed on machine and its output, all inconveniences; weak spots in the machine during its operation and servicing are found out. Second stage of the preliminary operations, consists of the following measures;

- Removing all guards and protective arrangements of machine to facilitate access and inspection of moving and guiding parts of the machine. Removing or loosening flexible transmissions (belt, rope and chain drives etc.
- Inspecting and checking the condition and position of external rubbing parts subjected to impact loads and high stresses (tables, slides ,carriages, screws etc,)

- Inspecting and checking the tightness and rigidity of the fixed joints on the machine.
- Checking the radial and axial play of the movable joints.
- Checking the smoothness of travel and positions of all moving parts directly by hand or with levers.
- Checking the condition and action of locking and all fastening arrangements and also the starting, control and braking devices.
- Checking the foundation bolts.

2.5 Minor adjustments and repairs

Repair means responding to the breakdown of equipment and undertaking work to correct the problem in order to return the equipment to a working condition. Before equipment can be repaired, you need to be aware that there is a problem! Therefore, there should be a clearly understood ***system for reporting faults and breakdowns*** and equipment users should be encouraged to report faults and breakdowns as soon as possible.

- Simple repairs can be done by the in-house or external maintenance and repair team.
- More complex repairs will be carried out by specialized maintenance personnel.

2.6 Basic repair operations

The operations involved in woodworking /bamboo machinery can be classified into 5 basic types;

- Local tightening up of loosened worn parts.
- Local fastening of worn, broken parts.
- Partial adjustment of position, interconnection and interaction between individual parts of machine.
- Partial restoration of broken parts.
- Partial replacement of worn, broken or missing parts.

Name…… ID……..Date……

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: - choice the best answer from the given alternatives.

1. One is not include in basic repair operations that may involved in wood/bamboo works machinery
   A. Local tightening up of loosened worn parts.
   B. Local fastening of worn, broken parts
   C. Partial restoration of broken parts.
   D. Partial replacement of worn, broken or missing parts.
   E. Non

Test II: - say true or false (1 point)

1. Routine maintenance tasks are difficult and complex in nature and only require specialized maintenance personnel.

Test III: - write short answer for the following questions

1. List at least 4 typical examples of routine maintenance(4 points)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 6points ***Unsatisfactory - below 6 points***

Information Sheet 3- Cleaning, returning & storing tools

3.1 Cleaning

Cleaning is the process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from an object or environment. Cleaning occurs in many different contexts, and uses many different methods.

Clean up dust and stain by the broom and wiping cloth as one of daily operation. In wood /bamboo works a variety of activities are performed. Thus, we use different tools and equipment such as, machine, jig, tool, cutting tool and measurement tools. These tools and equipments should be clean after work and it should be a daily activities.

3.2 Storing

Sorting and arranging tools and equipments are easy to use & labeling them so that they are easy to find out & put away.

- Labeling, numbering, zoning for clear identification of storage areas to keep necessary items.
- Set necessary items matching with workflow to minimize unnecessary movement and transportation time

Figure9. Sorting and storing

Name…… ID……Date……

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers.

Test I: - Say true or false (1 point) each.

1. Set necessary items matching with workflow to maximize unnecessary movement and transportation time.
2. Cleaning occurs in many different contexts, and uses many different methods.

Test II: - write short answer for the following questions

1. What is cleaning (2 points)
2. Write the use of sorting and arranging tools(2 points)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 6points ***Unsatisfactory - below 6 points***

Information Sheet 4- following environmental procedures and waste

4.1 Environmental Management Issues

The environmental management issues that typically can arise from wood/bamboo processing include:

- Air emissions
- Solid waste generation
- Storm water and wastewater
- Noise, and
- Management of hazardous substances.

A. Air Emissions

Wood/bamboo processing operations can generate air emissions from a range of sources. Sanding, sawing and machining of timber produce wood dust and larger particulates. Yards and trafficked areas can also generate dust emissions. Boilers emit combustion products such as carbon monoxide (CO), oxides of sulphur (SOx), oxides of nitrogen (NOx), particulate matter (PM) and volatile organic compounds (VOCs) from wood and bark. The type and volume of combustion products will vary according to the type of fuel selected. Kiln drying of wood and the use of solvents, coatings and lacquers also contribute to the emission of VOCs.

B. Solid Waste Generation

Solid wastes resulting from the wood/bamboo processing include the bark, sawdust, solid pieces such as off cuts/dockings from the milling processes and shavings. Other potential sources of solid waste include yard waste, solids from log washings, ash from boilers, and general rubbish.

C. Waste water and Storm water

Wastewater is generated from runoff from log sprays in log yards, condensate from kilns and boiler blow down. Storm water can be contaminated with pollutants such as sawdust, litter,

petroleum products, solvents, coolants, degreasing agents, rubber particles, detergents and sediment.

D. Noise

The emission of noise is considered to interfere with a person's enjoyment of the environment if it is unreasonable with respect to its volume, intensity or duration; and the time, place and other circumstances in which it is emitted.

Excessive and/or unreasonable noise emissions from activities such as cutting, sawing, moulding and chipping can create an environmental nuisance. Noise impacts are greatly reduced where there is adequate separation distance between the noise generating machinery and any sensitive receptors, such as residences.

E. Management of Environmentally Hazardous Substances

Hazardous substances released to the environment can cause significant short and long term environmental damage. All hazardous substances should be appropriately stored and handled to reduce the risk of release to the environment. Hazardous substances include chemicals, fuels, oils and wastes. Substances usually considered harmless can also cause environmental harm or nuisance if they are spilled in large amounts, or in the wrong place. It is important to manage not only the risk of a large spill, but also smaller spills or leaks that may accumulate over time.

4.2 Environmental Management Principles

It is recommended that the industry and individual operators adopt the following environmental management principles to deal with issues described in Section

- Ensure that staff, contractors and others remain aware of their role in reducing the environmental impact of wood processing operations.
- Prevent contaminated wastewater runoff and other liquid and solid pollutants from entering surface water, groundwater and soil.
- Minimise the release of vapours and other fumes.
- Minimise noise and odours generated on site.

- Prevent existing contaminants in soil and sediment from being remobilised into the environment during construction or development works (for example excavation or associated activities).
- Minimise the production of solid and liquid waste.
- Maximise the recycling of solid and liquid waste, in particular treated wastewater and non-hazardous general waste.
- Dispose of non-recyclable wastes and general wastes offsite in accordance with State and local government requirements.
- Maintain sufficient documentation and records to define the site's environmental management program, monitor progress towards sustainability and demonstrate compliance with State and local government requirements.
- Be prepared to respond effectively to emergency situations which threaten human or environmental health.

Name…… ID……Date……

Directions: Answer all the questions listed below accordingly. Examples may be necessary to aid some explanations/answers..

Test I: - write short answer for the following questions

1. List the environmental management issues that typically can arise from wood/bamboo processing (4 points)
2. Write at least 4 environnemental Management Principes (4 points)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 8points ***Unsatisfactory - below 8 points***

Operation sheet 1– Routine adjustments and repairs

Steps / Procedures for Checking for conformance of components

Step 1 - Establishing Standards and Methods for Measuring Conformance
Step 2 - Measuring the Conformance
Step 3 - Determination of Whether the Conformance Matches the Standard,
Step 4 - Taking Corrective Action

Operation sheet – 2	Grinding Engineering

Operation title: **Grinding Engineering / Workshop Steel Parallels (Block)**

Purpose: To develop the ability to perform intermediate grinding operations in accordance with operational standards

Material: Two pairs of parallels, firstly machined to rough dimensions, leaving a few millimeters to allow the rest to be ground and then hardened to 55 - 60 HRC

Specifications: Grade B - Lower surface tolerances Parallels are rectangular blocks, made from **steel**, which have 6 faces **ground** and finished to a precise smooth surface finish.

In Built Features: Description of Technical data and Standard Quality

- Variation in matched parallels is within 0.010 mm.
- Thickness, width and length are nominal and within ±0.1 mm upto 200 mm Length, ±0.2 mm upto 450 mm Length.
- Accuracy for Parallelism & Squareness is ±00005 mm upto 200 mm Length and ±0.010 mm upto 450 mm Length.
- All the four sides are chamfered.

Use:

Parallels are used in machining operations, to accurately support a clamped work piece from underneath, to eliminate the work piece being pushed down by the force of the cutting tool, to give clearance or raised evenly from the vise, keeping the work parallel; and it also used for comparison with a surface or machined face to check the flatness.

Condition for the operation: Fully organized work shop, good working condition

Precautions: - Wear protective clothing

Tools and equipment:

- Vernier caliper
- Students Guide

- Goggles

Working drawing:

Procedures for Grinding Engineering Parallels (workshop steel parallel block)

1) Two pairs of parallels, firstly machined to rough dimensions, leaving a few millimeters to allow the rest to be ground and
2) then hardened to 55 to 60 HRC.
3) They are then paired and placed in a grinding machine, and each face is ground until the overall dimensions are correct - they are paired during this stage so that even if the dimensions are not correct, they are still parallel to each other.
4) Then, the individual finishes are applied,
5) machining a chamfer along the edges to remove any burrs or sharpened edges

Quality criteria: The article must be made to the given dimensional accuracy.